GAS JOURNAL, MAR. 13, 1946

VOL. 247 98th YEAR No. 4321

THE REGIONALIZATION ISSUE

MANY people hold the opinion that it is unfortunate that the future of the Gas Industry should have become a political issue. For their fulfilment politics require, of course, that the electorate shall be swayed to vote in a particular direction, and we have not noticed any prevalence in politics of views being based on severely technical considerations. Neither those who vote nor those who ask for votes generally are acquainted with the technical aspects of any industry. The future of the Gas Industry should depend largely on decisions reached as a result of informed technical opinion, and it seems to us that the voice of informed technical opinion is heard but little by those in governmental authority. With the present electoral system a party may attain power to carry out an omnibus programme which may involve a few major issues on which the election is fought, coupled with several issues regarded as of secondary importance thrown into the pot and melted up, as it were, without the electors paying any great attention to them. An elector may vote for a major issue, though heartily disliking a secondary policy which may be involved in that issue.

As previously recorded in these columns, the British Gas Council has adopted a non-committal attitude regarding the future of the Gas Industry, and as a result of this policy many people, who would in normal circumstances be only too happy to express their views, remain silent on the most important question which concerns the Industry. True, many chairmen of gas companies have put forward their views in no uncertain way at company meetings, but these are essentially individual views, and as such cannot be regarded as representative of the united views of the Gas Industry.

These comments by chairmen, which we have recorded in the "JOURNAL," are to the effect that nationalization *per se* cannot be regarded as the solution to the problems of the Gas Industry. Mr. Herbert Morrison recently declared that "in itself a policy of nationalization is controversial. . . . Let the argument be directed," he said, "to the merits and let the test be the public interest." This remark, it should be noted, was made many months after the General Election, and it would appear logical to conclude from it that the Government stands in need of counter proposals from those who disagree with the nationalization policy of any particular industry, from which again logically it follows that the Government requires in the immediate present the proposals of the Gas Industry speaking as such.

We have, of course, commented on the findings of the Heyworth Committee, and we would emphasize that this Committee did not specifically report in favour of nationalization. On this issue other industries are certainly showing fight. Lord Royden, Chairman of the London, Midland, & Scottish Railway Company has told his stockholders: "We intend to fight nationalization by all lawful means." Last week Lord Portal, Chairman of the Great Western Railway Company, said that whatever might have influenced the Government in deciding that their proposals were desirable in the national interest, there must inevitably be grave doubts among the users of the railways and the staff employed in operating them as to the need for such a fundamental change as would be entailed by nationalization. During the week the Chairmen of the Southern Railway and the L.N.E.R. added their voices in opposition to the proposed nationalization of the railway services.

While naturally the case that there might be public advantages arising from nationalization must be presented by the nationalizers, similarly there should be no undue delay by those opposed to nationalization in presenting their counter proposals, with the object that the solution shall not be merely at political level. Everything, of course, is bound up in the help which industry can give to the consumer, and the Gas Industry ought to be in a position to state how it thinks that help could best be given.

The British Gas Federation produced in its 1943 Planning Report an alternative plan to nationalization. The B.G.F. plan was not accepted by many gas undertakings. Then came the Heyworth Committee to remedy former defects and to accelerate progress. Many of those in responsible positions in the Gas Industry did not particularly like the Heyworth Report, which, of course, is open to criticism. But the fact remains that the British Gas Federation and the Heyworth Committee agree on one most important point—the need for regionalization. On the other hand, some chairmen of gas undertakings have declared themselves against regionalization on the ground that there is work in plenty to control successfully the present larger undertakings without adding to their size, and that within their areas they are giving an efficient service. Changes are, however, needed in many respects in the Gas Industry, not because, again taking the Industry as a whole, it can be regarded as being inefficient, but because under its present working arrangement it is patchy in its service, and presents to the consumer anomalies in price structure and service which are difficult for the consumer to comprehend. In any industry there are undertakings which are below average level, just as there are others which are above average level. The Gas Industry cannot be satisfied unless the inefficient undertakings are brought up to the level of the very best. How are we to determine the proportion of the Gas Industry which is inefficient? Should it be on the basis of the quantity of gas made? If so, we have little hesitation in declaring that basically the Gas Industry is reasonably efficient, but this does not in the least mean that greater efforts should not be put forward to improve what is already good. Again, to meet changing social conditions new methods will have to be evolved.

To what extent will nationalization be likely to sweep away the spur of competition if all fuel industries are co-ordinated in such a plan? Will removal of competition be in any way beneficial to the consumer? Regarding this angle it has always appeared to us that competition has been in the consumer's favour, and incidentally that a great deal of the Gas Industry's development has resulted from competition from the electricity industry. Admittedly some forms of competition are bad, and we have had much to say on the overlapping of different forms of fuel entirely at the expense of the consumer. Such overlapping has, in the past, led to the uneconomical use of fuel, and we have no doubt that much would be accomplished if certain broad lines of policy based upon technical principles were laid down as to the forms of heat employed for particular fields of usage. Regionalization of the Gas Industry could not do other than benefit the Industry from the point of view of competition. We are not saying that there is especial merit in a large gas-works as compared with a gas-works of medium size—that is, so far as concerns technical efficiency. But there are considerations other than those of a purely technical nature, and these considerations include the transmission of gas to areas hitherto not supplied, or at any rate supplied inadequately. There have been notable examples of the efficient supply of gas to such areas as the result of regionalization under private enterprise. Does it follow that nationalization will accelerate progress in this direction and in other similar ones? Regionalization is a means of giving better advice to the consumer, and in general of operating on a more vigorous and more unified commercial scale. Is it the duty of the British Gas Council to set down in black and white exactly what is required to enable the Gas Industry to function in the most efficient manner? There have been many general statements, but cannot we at this juncture expect a specific statement concerning what

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objectives we are setting out to attain? Answers to current questions are, of course, not easy to find, and experience of very large undertakings in the past suggests that while the overall policy and technical control may be of a higher order than in smaller undertakings, there are disadvantages in operating a very large concern in the absence of decentralization.

We write this while the Minister of Fuel and Power has not yet indicated his reaction to the Heyworth Report. We write it, too, in the belief that now is the time for the Gas Industry to express its views firmly and to cease sitting on the fence. Who is to give the lead?

Controlled Electric Hotplate Burner

We learn from *Science Digest* for March that the Proctor Electric Company of America have introduced an electric hotplate burner which, it is claimed, will heat up as fast as a gas burner, and also may be controlled thermostatically. The unit, we are told, consists of three parts: a heating coil embedded in a heat-conductive cement; a switch arrangement called a "supercharger," that supplies extra current to bring the cold burner up to red heat within a fraction of a minute; and a centre disc containing a thermostat that makes it possible to maintain any cooking temperature desired. The description of this remarkable burner was given by the Vice-President of the Proctor Research Department, and he is quoted as saying that instead of the high, medium, and low speeds to which most electric burners are restricted, this new device will allow the burner to be set at any speed ranging from "tepid warm," for keeping food warm without burning it, to a constant high speed. The idea behind this device—and we have no idea how it acts in practice—is that the thermostat is governed by the temperature of the food in the cooking utensil, and that this thermostatic control will adjust the burner as necessary to assure even cooking.

Clear and Concise Reports

In recent issues of the "JOURNAL" we have spoken of the need for clear and concise reports, and a considerable number of letters on this question have reached us, and have been published. We have spoken particularly of research reports, but this is only one aspect of the whole problem, and we thoroughly agree with Mr. F. W. Allum, Secretary of the York, Harrogate, and District Group of Gas Companies, in his comments on the preparation of statements and reports for management purposes—a subject which has not received sufficient consideration in the past. There can be no doubt that the recipient of a report, to be in a position readily to understand the purport of its contents, should be able to take for granted its phraseology is clear. "Many executives," said Mr. Allum, "imagine that unless a report is voluminous, and any statements or statistics which are given are numerous and elaborate, the report does not show how much work they have put into its preparation. It is surprising also that the General Manager and the Directors often measure the amount of work by the length of a report, but unless they are very meticulous and painstaking, I doubt whether they have the time or the opportunity to assimilate all the details submitted to them. A report and any statements which would support the reasoning outlined in it should be as concise as possible. It should start with the terms of reference clearly defined, so that what follows can only relate to the matters which have been dealt with. This should be followed by facts and details that have been found. Assumptions must be clearly stated, and conclusions should be stated either as a finding of fact or opinion based on the written assumptions. If a recommendation of some action is to be made, care should be taken to see that if such recommendation is challenged in any way, answers and reasons are known for any points which are disputed or queried.

"Statements are always prepared to show a result, and if this result is obscured by a mass of irrelevant detail, the whole purpose of the statement may be lost. I have in mind the submission of statements showing various costs of processes or jobs or other routine matters. If a total cost is required it is better to show the main headings of the items making up the total rather than a number of subsidiary headings. Later, if the figures given are insufficient, it is a simple matter to elaborate the details, but the preparation of a mass of details in advance means in many cases a waste of time."

Falkirk Town Council have decided to spend £17,820 on the purchase of new plant for the municipal gas-works.

The **Midland Junior Gas Association** President's Day visit to Bilston, provisionally arranged for Mar. 21, has been postponed until later in the season.

Personal

Colonel R. H. STUDHOLME, O.B.E., has been appointed a Director of the Severn Valley Gas Corporation, Ltd.

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Lieut.-Colonel C. P. DAWNAY, C.B.E., M.V.O., has been appointed a Director of Gas Consolidation, Ltd.

* * *

Mr. H. E. S. BIRKS has been appointed Deputy Engineer to the Spalding Gas Department.

* * *

Mr. J. RINGHAM, Chief Clerk and Cashier to the Stamford Gas Company, has retired after 43 years with the Company, and has received a presentation from the staff and employees.

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Mr. J. H. RACE, Engineer and Managing Director of the Radcliffe, Farnworth, and District Gas Company, has been appointed to succeed Mr. A. PHILIP ALLAN as Engineer and General Manager of the Scarborough Gas Company.

* * *

Mr. GEORGE BATES, Order Department chief of John Wright & Co., Ltd. (Radiation Ltd.), has retired after 40 years' service. In presenting him with a cheque on behalf of the directors and staff, Mr. J. Ivan Yates, Managing Director, referred to Mr. Bates's father, who had also served the Company for many years.

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Major COLIN WOODALL, M.B.E., has been appointed London Area Sales Manager of the Parkinson Stove Company, Ltd. Major Woodall has previously been associated with other Companies in the Parkinson and Cowan Group, and rejoins the organization after several years in the Forces.

* * *

Mr. D. J. O. BATH, Assistant Engineer to the Peterborough Gas Company, has been appointed Deputy Engineer and Manager to the Bilston Gas Light and Coke Company. Prior to his appointment at Peterborough, Mr. Bath was at West Bromwich, Hampton Court, and Clevedon.

* * *

Consequent upon the resignation of Mr. E. BATES from the position of President-Elect, on his taking up an appointment outside the area, Mr. J. C. HOGG (Stretford) has been elected by the Council of the Manchester and District Junior Gas Association to be President for next session.

* * *

Mr. W. A. LINEY has retired after 55 years' service with John Wright & Co., Ltd. (Radiation, Ltd.) the occasion being marked by the presentation by Mr. J. Ivan Yates on behalf of directors and staff. His friends will also remember him for his gifts both as entertainer and caricaturist. He was one of the first to broadcast from the old 5 I.T. (Birmingham) Station.

* * *

Mr. J. L. THOMSON, Engineer and Manager of the Newport (Fife) Gas Department, has received an appointment with the British Control Commission for Germany and Austria. He is to start his new duties early next month as senior technician. Mr. Thomson was employed for six years with Kilmarnock Gas Department as distribution superintendent, before going to Newport in 1941.

* * *

At a Board meeting prior to the annual general meeting of the Wandsworth and District Gas Company, on Mar. 5, Col. C. M. CROFT, D.L., J.P., President of the Institution of Gas Engineers, was appointed a joint Managing Director. Colonel Croft has been connected with the Gas Industry for more than 38 years, of which 35 have been with the Wandsworth Company, where he was Chief Engineer and General Manager, and had a seat on the Board up to the date of his new appointment. Trained under one of the most eminent engineers of his day, the late Mr. H. E. Jones, Col. Croft has played a prominent part in the expansion of the Wandsworth Company from the days when it was the old Wandsworth and Putney Gas Light and Coke Company, up to the present time, when its area of supply covers some 160 square miles, extending as far as Woking.

It is Proposed to increase the price of gas at Inverness by 2d. per 1,000 cu.ft. from Aug. 15 next. This will bring in additional estimated revenue of £1,836 during the remainder of the financial year, and £2,303 in a full year.

Stockholders of the Rushden and Higham Ferrers District Gas Company, at an extraordinary meeting, gave unanimous approval to the Rushden District Gas Bill now before Parliament. The Chairman, Mr. J. Roe, outlined the purpose of the Bill, which includes provision for the merger of the Rushden and Raunds gas undertakings. Plant of modern design is in course of erection at the Rushden works.

Waste Heat Recovery Conference

The date of the conference on industrial waste heat recovery arranged by the Institute of Fuel—details of which were given in the "JOURNAL" last week—has been changed from May 1 to April 30. The change has been made to enable members to avail themselves of an invitation from the Iron and Steel Institute to attend the annual meeting of the latter Institute on May 1 and 2, and also to welcome members of the Iron and Steel Institute at the waste heat recovery conference.

The meeting of the Iron and Steel Institute will open at 4, Grosvenor Gardens, S.W. 1, at 9.45 a.m. on May 1, and there will be three Papers of interest to fuel technologists—*viz.*, "Fuel Problems in the Swedish Iron and Steel Industry," by M. Tigerschiöld; "Problems in Fuel Efficiency," by C. Hulse and R. U. Sarjant; and "Fuel Utilization in Iron and Steel Works: Consideration of Some Problems," by N. H. Turner and F. A. Gray.

Advice on Fires

We recently announced the publication of Part 6B of the *Manual of Firemanship* issued under the authority of the Fire Service. The book describes means of tackling fires in various technical industries, and devotes a complete chapter to "Town and Other Gas and Fires in Gas Undertakings." Commencing with a brief outline of the essentials of gas-making and the apparatus employed, every possible source of fire is explored. The book is, of course, intended primarily for the fireman or the layman, and the gas engineer will be fully conversant with most of the information it provides. It is, however, worthy of some attention as a refresher course, and much of the advice it contains is based upon wartime experience.

This is particularly true of fires in gasholders—a rare occurrence in ordinary practice, but one which presented many dangers in wartime. One of the most vulnerable spots in a gas undertaking, the oil storage, is dealt with in considerable detail in a separate chapter on "Fires in Oil Installations." There is a comprehensive section dealing with fires in both domestic and industrial premises, and a section is devoted to acetylene installations. Use of respirators and First Aid is mentioned.

The manual emphasizes the necessity of seeking advice from responsible officials when handling fires in gas mains or in actual gasworks, and gives warning of the dangers which may ensue as a result of ignorant action.

Part 6C of the manual, which is in course of preparation, will give instruction in dealing with such pertinent matters as fires in coal and coke dumps, etc.

Diary

Mar. 15.—North of England Gas Managers' Association (Auxiliary Section): Additional Spring Meeting, "High Pressure Gas Distribution," G. E. Haddon, Gas-Works, Stockton-on-Tees, 2.45 p.m.

Mar. 16.—Yorkshire Junior Gas Association: Visit to Sturton Works of Yorkshire Tar Distillers, Ltd., 2.45 p.m.

Mar. 18.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m., Royal Horticultural Hall, Vincent Square, Westminster.

Mar. 20.—Manchester and District Junior Gas Association: Visit to works of Manchester Oxide Co., Ltd. 2 p.m., "Certain Aspects of Purification," H. B. Avery.

Mar. 21.—Midland Counties Coke Association: Eighth Annual General Meeting. King Edward House, 135, New Street, Birmingham, 2.30 p.m.

Mar. 22.—London and Southern District Junior Gas Association: Reception and Dance, Caxton Hall, Westminster.

Mar. 23.—London and Southern District Junior Gas Association: All-day conference at Gas Industry House, including six Technical Papers covering Education, Gas Manufacture, and Gas Utilization.

Mar. 26.—Institute of Fuel: Sound Film, "Steam," Royal Geographical Society Hall, 6 p.m.

Mar. 26.—Southern Association of Gas Engineers and Managers (Eastern District): "A New Method of Increasing Retort Tightness," A. Bird, London Manager of West's Gas Improvement Co., Ltd., Gas Industry House, 2.30 p.m.

Mar. 26.—Midland Junior Gas Association: Visit to Foleshill Works, Coventry Gas Department, 3.30 p.m. "Six Years of Production Problems, Investigations, and Results," A. E. West, 6.30 p.m.

Mar. 28.—Midland Association of Gas Engineers and Managers: Annual General Meeting, King Edward House, New Street, Birmingham, 2.30 p.m.

April 12.—North British Association of Gas Managers: Spring Meeting, Lesser Town Hall, Coatbridge, 10.30 a.m. Presidential Address, Mr. T. S. Lockhart, Rothesay.

Sunderland Gas Company has received sanction from the Ministry of Fuel and Power to increase the price of gas by 0.6d. a therm. It is claimed that the Company's gas charges are still among the lowest in the country.

A Microid Nalik Press, manufactured in this country, is now available, and is described in a pamphlet from the makers, Griffin & Tatlock, Ltd. It boasts several advantages over other sodium presses, the one-piece die and mould being of stainless steel. The instrument is easily movable, and is designed to ensure complete rigidity.

Nearly £160,000 is to be spent this year on developments at Darlington Corporation Gas-works. Over £10,000 is to be spent on a high-pressure trunk main from the gas-works to Parkgate, and from Parkgate to the junction of Clifton Road and Parkside. Sanction has been received to borrow £107,500 for new gasholders.

Two Names were omitted from the recently published list of representatives nominated by the British Gas Council to the British Tar Confederation. The Secretary of the Confederation asks us to announce that in addition to the names published, Mr. C. M. D. Belton and Colonel H. C. Smith were nominated as B.G.C. representatives.

Gas Meter Rents have been abolished by the Nottingham Gas Department. It is estimated that the cost of this decision to the Department will be about £10,000, less income tax which would have been charged on the amount of profit. The concession amounts on the average to approximately 5s. 3d. per consumer per annum, and takes effect as from Jan. 1 last.

The Warrington and District Works Engineers' Society has been formed as the result of a meeting organized by Mr. A. H. Burton, Deputy Engineer of the Warrington Gas Department, at the gas showrooms, at which Mr. W. H. T. Johns, Engineer and Manager, welcomed some 40 engineers from local firms. Mr. L. Robinson and Mr. S. M. Duguid, of the Ministry of Fuel and Power, spoke on the advantages of such organizations.

A Distinguished Company from the fuel and building industries was present at the opening of the new headquarters of the Women's Advisory Committee on Solid Fuel at 18, South Molton Street, W.1. The ceremony took place on Feb. 6, and was marked by an address on the coal industry's problems and the efficient use of fuel by Sir Guy Nott-Bower, Deputy Secretary to the Ministry of Fuel and Power. The new premises are equipped with offices, committee room, showroom, and demonstration kitchens.

A Revised British Standard Specification for visual type portable photometers (B.S. No. 230) has just been issued. The principal change is the inclusion of a type of photometer for very low illumination measurement, the effective range being specified for this type as from 0.0005 to 0.5. Other minor modifications have been made to bring the specification up to date with present practice. Copies may be obtained on application from the British Standards Institution, 28, Victoria Street, London, S.W. 1, price 2s. net, post free.

The Ministry of Fuel and Power has given permission to the Liverpool Gas Company for the erection of a 2,750,000 cu.ft. 4-lift spiral guided gasholder in an existing tank at Linacre; a 1,500,000 cu.ft. 2-lift spiral guided gasholder, prepared for extension to a 4-lift holder at the Linacre Works, and a 3-lift spiral guided holder with a capacity of 700,000 cu.ft., in an existing tank at the Athol Street Works, at a total cost of approximately £160,000. The contract for the three holders has been let to Messrs. Clayton, Son & Co., Ltd., of Leeds.

It was a happy thought of the British Gas Council to hold a party on Valentine's Day—another V-day for the Gas Industry. The venue was 6, Stanhope Gate, and there was a gratifying response to the invitations. The arrangements made were excellent in every way, and the informal programme included an interesting film show which was greatly enjoyed. As we have suggested, there was absence of formality—no set speeches but plenty of conversation. This British Gas Council's Valentine party was undoubtedly a successful goodwill creator.

Forty Members of the Science Society of the Sheffield Girls' High School paid a visit on Mar. 2 to the Grimesthorpe Works of the Sheffield and District Gas Company. The tour of the works was rounded off by a visit to the new central laboratory, where the students witnessed demonstrations associated with the analysis and tests of gas and the by-products of coal. The students were presented with souvenir booklets dealing with "Home and Kitchen Planning" and the "Treasure in Coal," the gift of Mr. Ralph Halkett, General Manager and Chief Engineer.

Writing in the first post-war issue of Pilchers' reconstituted *Gazette* —a souvenir number to mark the end of hostilities—Mr. Myles G. Routledge, a Director of Pilchers, Ltd., Paint Manufacturers, of 6, Chesterfield Gardens, W. 1, contributes an article, "Looking into the Future," and makes many claims for the future of paint which will undoubtedly have a great bearing upon the industrial and retail decoration fields. The Editor (Mr. C. J. Clayton, late Employment Officer of the Publicity Section of the Ministry of Labour and the Company's Advertising and Sales Promotion Manager) is to be congratulated upon the production of a really fine printing job.

Coal Board

Mr. Shinwell, Minister of Fuel and Power, announced in the House of Common on Thursday that Lord Hyndley was to be chairman of the National Coal Board. He was not yet in a position to announce the name of the vice-chairman, who would be the ninth member of the Board, and would be selected for administrative and organizing experience and capacity. The members of the board so far appointed, in addition to the chairman, are: Sir Walter Citrine, General Secretary of the Trades Union Congress; Mr. Ebby Edwards, General Secretary of the National Union of Mineworkers; Professor Sir Charles Ellis, Scientific Adviser to the Army Council since 1943; Mr. J. C. Gridley, lately Chairman of the European Coal Organization; Mr. L. H. Lowe, Director of Finance at the Ministry of Fuel and Power, 1943-45; Sir Charles Reid, Chairman of the Reid Committee; and Mr. T. E. B. Young, Managing Director of the Bolsover Colliery Company.

Reports on German Industry

Further reports submitted by teams of industrial experts, who have visited Germany under the auspices of the Combined Intelligence Objectives Sub-Committee and the British Intelligence Objectives Sub-Committee for the collection of scientific and technical intelligence from German industry, are now available for publication. Among them are:

CIOS XXXI—28. Fuel Technology and the Reichsvereinigung Kohle, price 1s. 6d., post-free 1s. 7d.

CIOS XXVIII—23. A.G. Sachsische Werke-Espenhain: Fuels and Lubricants from brown coal, price 2s., post free 2s. 2d.

BIOS 120. Wirtschaftliche Forschungsgesellschaft m.b.H. Hitzacker. Depot: Fuel storage and blending station, price 4s., post free 4s. 2d.

CIOS XXVIII—36. H. Koppers G.m.b.H. Essen: Low temperature carbonization of coal, synthesis gas production, price 1s., post free 1s. 1d.

The reports are on sale at H.M. Stationery Office.

Glass Tubing

In a lecture at Gas Industry House last month Mr. R. E. Threlfall discussed the subject of glass tubing, his remarks being addressed to the London Section of the British Association of Chemists. In the course of his address the lecturer said that the average laboratory usually holds stocks of soft soda and hard borosilicate glass tubing and rod, with some combustion tube and possibly some lead glass. In a physical laboratory some special tungsten and molybdenum sealing glass may be necessary, but in the chemical laboratory an occasional platinum seal is usually all that is wanted. The laboratory furnisher can supply all these needs, but the chemist must keep a careful watch on the activities of the buying department in the bigger firms or institutions, who are inclined to buy on price and not on quality, with results that may be very disturbing in the laboratory.

In some introductory notes Mr. Norman Sheldon said that German power and influence in Europe was to a large extent spread through German text-books recommending German scientific equipment. Britain was shackled even in spite of men like the lecturer, who fought against enormous odds. "These battles, and the difficulties he overcame would," said Mr. Sheldon, "have dismayed a less formidable contestant."

Gas in Sheffield Industries

The Industrial Gas Centres Committee met in Sheffield last week at the invitation of Mr. Ralph Halkett, General Manager and Chief Engineer of the Sheffield and District Gas Company. The members took the opportunity of spending two days in the city in order to see some of the great development work in the industrial usage of gas in some of the world's most famous steel works.

The works of Messrs. Firth-Vickers Stainless Steels, Ltd., were visited on the Wednesday afternoon; where the visitors were welcomed by Mr. J. Wortley Fawcett, Managing Director, and were then conducted round the works to see the production of "Staybrite" stainless steel.

At the Vickers Works of the English Steel Corporation, Ltd., the Committee was welcomed by Rear-Admiral J. F. C. Patterson, O.B.E., Special Director, and again were conducted round the works to see the manufacture and fabrication of all types of steel, and especially of alloy steels. As long ago as 1931 this firm had installed gas-fired regenerative furnaces for the drop-stamping of crankshafts, and it was those crankshafts that were used in the machines which broke every British record on land, water, and in the air. It was the experience and confidence gained with these gas-fired furnaces which were put to such excellent use during the war.

The visitors were naturally interested in the amount of gas used for all processes, both for reheating and heat treatment.

Messrs. Thos. Firth & John Brown, Ltd., the associates of Messrs. Firth-Vickers Stainless Steels, Ltd., use more gas for industrial purposes than any other firm in Great Britain.

Britain's Coal

An Address delivered recently by W. Wakefield Adam to the Institute of Export has now been published in booklet form. Entitled *Britain's Coal Crisis—A Plan for Prosperity*, it puts forward an ambitious plan to conserve our waning stocks of coal without endangering our export trade. Broadly speaking, his suggestions are: greatly increased carbonization of coal; export of coal products rather than raw coal; increased use of smokeless fuels for home consumption; modernization of industrial works by electricity, thermal insulation of buildings, and utilization of exhaust steam and hot water; reorganization of coal mines with improved equipment and improved conditions for workers; enquiry into new sources of power and increased research. A complete section is devoted to the electrification of railways, by which means, it is claimed, 10 million tons of coal can be saved annually. Smoke pollution, problems of falling birthrate and employment receive mention, and the booklet contains a folder showing diagrammatically the products obtainable from coal. It is available from Simpkin, Marshall (1941), Ltd., price 1s.

Fuel and the Housewife

The new housing programme gives rise to additional demands for fuel. The Minister of Fuel and Power must therefore ensure that these additional demands are kept to a minimum, and that the maximum benefit should be obtained from the fuel burned. This means, in other words, an efficient appliance properly installed in a well-insulated house. At the same time, the standards of comfort demanded are going up and the size of the post-war houses is greater than the pre-war, so that, apart from the fuel shortage, if the householder is not to have an impossible burden of weekly expenditure on fuel, the highest standards must be obtained with the minimum consumption and therefore at minimum cost. In this connexion, the Fuel and Power Advisory Council set up by the Minister of Fuel and Power to the late Government has recently submitted a report on domestic fuel policy, which will be published shortly.

Improved appliances involve additional capital cost. This cost can usually be recovered from the reduced running cost in about two or three years, but if local authorities, builders, and the public generally are to be induced to install them, it must be demonstrated that the increase in capital cost is more than represented by the fuel savings and increased output. In the temporary pre-fabricated houses for which the Ministry of Works is responsible, openable stoves with back boilers are installed, designed to burn coke and to supply warm air to the bedrooms. Unfortunately, the tenants have no experience of using these appliances, with the result that in many cases they are subjected to abuse.

The same difficulties apply to much of the other equipment provided, and will apply to all new housing. To overcome them, education and publicity for the housewife is necessary. As part of an educational campaign, an exhibition of domestic fuel efficiency methods and appliances has been organized by the Ministry of Fuel and Power, and will visit the leading centres of population, opening at Edinburgh on Mar. 22. The exhibition consists of:

(1) Three kitchen bays each with three walls, exhibiting in turn gas, electric and solid fuel cooking; each kitchen is 8 ft. high. The gas kitchen is 10 ft. by 8 ft., equipped with a gas cooker, refrigerator, washing machine, drying cupboard and sink heater. The kitchen is a working kitchen without facilities for meals. There are two electric kitchen models, both intended for flats, and equipped with cooker, refrigerator, and electric "two-in-one" water heaters under the draining board. The solid fuel kitchen is a dining kitchen, 10 ft. by 10 ft., equipped with modern lightly insulated closed cooker, which also supplies hot water.

(2) A fourth bay with three walls each 10 ft. long by 8 ft. high, one allocated to each of the three industries. The Gas Industry panel illustrates four different ways of providing hot water with gas or gas and coke equipment, and includes appliances. The electric industry panel illustrates hot water from "two-in-one" electric water heater, and is diagrammatic only, as the heater is installed in both kitchens. The solid fuel industry panel illustrates the multi-duty performance of the space heater with a back boiler, intended to supply warm air through ducts to the upstairs bedrooms. One openable stove will be shown.

(3) Two separate heating units loaned by the Ministry of Works: (*a*) A kitchen/bathroom unit, as installed in the emergency pre-fabricated bungalows, complete with gas or electric cooker, gas or electric wash boiler, gas or electric refrigerator on the kitchen side, Siesta stove at an end, bath and wash basin on the bathroom side. (*b*) A heat service pre-fabricated unit, intended to take the place of a brick chimney. With the unit is the slow combustion stove, hot water storage cylinder, cast-iron flue pipe, and space for gas or electric water heater for use in the summer.

Two British Commercial Gas Association lectures, "Gas Manufacture" and "By-products of Gas-Making," which have proved very popular, have been brought up to date. The existing slides have also been revised and a number of new ones added.

Education and Industry*

By Dr. P. F. R. VENABLES

Principal, Southend Municipal College

EDUCATION is as wide as life, and no simple definition of it is possible. It may be described as the harmonious development of the powers and personality of the citizen for his own good and that of his fellows. It must consider and provide for the needs of the individual as an individual and as a member of society, and in that order. The democratic way of life is based on the ultimate sanctity and significance of the individual, and the needs and purposes of society derive from those of the individual. Diametrically opposed to this is the concept of the State as ultimate, and that the individual is significant only in so far as he serves the State, which is the very essence of Nazism and Fascism.

In a democratic society, therefore, education must be concerned with—

(*a*) The individual with self-sufficient interests, recreations, pursuits, ideals—and no pressure of vocational training should be permitted to crowd out this fundamental side of his education.

(*b*) The individual as a worker with abilities and aptitudes which, for his own satisfaction and well-being, must be brought to fruition in meeting the needs of society, *i.e.*, of his fellow men.

(*c*) The individual as a member of society, with rights and duties, both of which need an appropriate and continuing education to enable them to be properly exercised.

Industry is immense in its scope and variety, in the range of its methods, and almost—judging from some recent reports—in the range of its efficiency! No one mind can comprehend the whole of it, but, looked at from the point of view of the individual, the issue is simple. For the citizen industry is, or should be, the organized means of production and distribution of goods and services to meet his needs as an individual and as a member of society. This is true for each and every one; the emphasis has moved from Materials and Money to Man. Considered in this way industry is not an end in itself, nor is it to be regarded as something separate from the community, any more than is education.

I do not therefore conclude that the needs of industry are any less real or significant because of an altered conception of its purpose, nor that education and industry should have little concern with each other. On the contrary, we must now consider their relationship closely.

Adequate and Healthy Leisure

In the first place if we consider the individual as an individual, we see that industry must provide conditions of work (hours, working conditions, canteens, &c.) which make it possible for him to have an adequate and healthy leisure life. The same applies also to his rights and duties in society, which should include the opportunity for further training and time off, for example, for duties on the local council.

The third consideration—*i.e.*, of the individual as a worker, with abilities and aptitudes—is of crucial significance. Industry needs employees with the right abilities and aptitudes in the right place at the right level, while education must be concerned with the selection of such aptitudes and the raising of abilities, so that individuals are placed and trained for appropriate work. Education and industry meet in the aptitudes and abilities of the individual, but it must not be overlooked that both are equally and vitally interested in personality and character.

But there is a second important aspect of the relationship between education and industry. We are beginning to realize the risks and penalties of too great a stress on individualism and the inadequacy of *laisser faire* as a social philosophy. At the same time we have been made keenly aware of the other extreme in Nazism and Fascism, under which the individual is reduced to a cipher in a soul-less state shorn of all democratic rights, burdened with inexorable, unquestionable duties. Somewhere between these two extremes we must somehow strike a balance which will hold in equity the rights and needs of the individual on the one hand and of the community on the other. One urgent problem is, therefore, how to give a social significance to education and to industry. With such a social significance in education will go an increased sense of responsibility, and we shall no longer consider incentives to work solely in terms of money. The education of the worker, of whatever grade, is the crux of the matter, but it will be of no use to endeavour to introduce this social significance into education and leave industry alone. That way lies complete frustration. It is against this background that we may consider the Education Act, 1944.

Education Act, 1944

It is charged with social significance, but it is founded on the individual. There is the fundamental change from the training on the 3 R's, reading, writing and arithmetic, to the three A's, education according to age, ability and aptitudes. It is realized that education does not take place in a vacuum, but has social roots and atmosphere—there is therefore to be a wide extension of related social services, health (medical and dental), provision of meals and milk, clothing, shoes, boarding facilities, travelling expenses, maintenance allowances and scholarships.

The Act gives three stages of education:

Up to 11 years	Primary.
11 + to 18 + years	Secondary.
After School leaving age } After 18 years . . } . . .	Further.

It might be thought that industry has no interest in the primary stage, but that would be very short-sighted. It has no specific interest, but on a long-term basis it has the highest possible interest in seeing that the education is the best possible that can be provided. Industrialists and employers, not to mention examining boards, have complained frequently and bitterly of the product of the old elementary schools and the inability to write, spell and to think clearly, but have not been conspicuous in their advocacy of smaller classes, better schools and equipment, which would go far to remedy their complaints. After all there is no sense in demanding a higher standard in the later stages and caring little about the foundation. Education according to the three A's (age, aptitudes and abilities) may become very difficult to achieve without insistence on a high standard of a fourth "A"—amenities.

The secondary stage includes all children of 11 to 18, and not only the old grammar schools. It includes the old elementary or senior schools, to many of which the stringent remarks I have just been making also apply, and the children attending these make up over 80% of the total of children of their age. After April 1, 1947, they will stay till 15 years of age instead of 14 as now. What kind of education will or should they have in that extra year, or in the extra two years when the leaving age is raised to 16? How far is industry concerned in this?

It is at the secondary stage that two factors of ultimate importance appear, and industry is vitally interested in both. These are the developing aptitudes of the pupil, and secondly, the impact of impending employment. Industry must therefore be closely concerned in fostering work on aptitude tests through such bodies as the Institute of Industrial Psychology, and in encouraging pre-employment secondary technical education. We need a considerable extension of this kind of secondary education, with its strong vocational interest and purpose. In passing, it may be observed that, properly conceived, such an education (which is not merely vocational training) can form the basis of a liberal education for life, in which the job is so important. The technical secondary school will utilize the aptitudes of the pupil, and meet his needs and interests in supplying the social needs of the community as they are served by industry. The Gas Industry on its manufacturing side should be most interested in the engineering course, and on the distributive side in the commerce course of a technical secondary school. Such schools will help to create a pride in belonging to an industry which has worthy scientific and social standards, thus renewing on a broader basis the loyalties of the ancient guilds.

With regard to the raising of the school-leaving age to 15 on April 1, and possibly later to 16 years of age, the question at once arises as to what kind of education will be given during that extra time. For all those who can profit by specialized courses it must be related in some measure to future employment, but it should include education for leisure, which should be the greatest fruit of technical progress to be enjoyed by all.

We need parents and pupils to have a much better chance of making an informed choice of future occupation, and we therefore need much greater publicity—accurate, and in the best British documentary tradition, talks by visiting specialists, and visits by both pupils and parents to works.

Part-time Day Courses

Three years after the school-leaving age is raised the County Colleges are due to be established—*i.e.* on April 1, 1950. Thereafter all young people in employment will be required to attend for one day per week in the employers' time without loss of wages and without payment of fees. This will create problems and opportunities for education and industry alike; it is imperative that both parties should, in the intervening period, work loyally together on a voluntary basis to establish the system of part-time day release. In this way we shall avoid a repetition of the tragic failure to establish such courses under the Fisher Act of 1918.

The transfer of evening attendance to part-time day courses will create a serious staffing problem on the technological side, and industry must be prepared to release senior staff (who formerly taught in the evenings) for such teaching duties in the daytime, as is strongly

* Paper presented to the Southern Association of Gas Engineers and Managers (Eastern District), Feb. 26.

recommended by the Percy Report. The courses must be related in some measure to the job for those in technical occupations. With an increased number of hours of attendance per annum in the daytime as against less hours in the evenings after a day's work, there will be better progress and a raising of technical standards. There will, however, be need for more than one day per week release for serious vocational work, and also beyond 18 years of age.

Pre-war enrolments for full-time day courses were lamentably small, totalling no more than about 2,000 students of over 17 years of age for the whole country. For an industrial nation this is a scandal, and it is pleasing to welcome the recommendation of the Percy Committee Report on Higher Technological Education that the number and range of such courses should be greatly increased. It is a pity, however, that the Percy Committee Report confined itself to engineering, which is easily the best served of the industries, both through the technical colleges and the universities, and did not give some figures comparing the situation with other industries in this and other countries.

In establishing such courses, close consultation between industry and education will be invaluable, indeed indispensable, and this is clearly recognized by the Percy Committee in its recommendation that Regional Advisory Councils and Academic Boards upon which industry would be represented should be set up. This last week the Ministry of Education has issued a circular calling on all authorities to implement this part of the Percy Report, if possible by not later than Easter, 1946—*i.e.* for nine Regional Councils to be set up. There is urgent need to transfer deserving part-time students to senior full-time technical courses. Such senior full-time cources would be for students between the ages of 17 and about 23, and would lead to responsible posts in industry. Other kinds of courses are urgently needed, and here one need only mention sandwich courses, refresher courses and courses in management.

In passing, one may note a considerable difference in attitude towards the question of supply of service and other personnel between the Percy Committee Report on Higher Technological Education and the Heyworth Report on the Gas Industry. The Heyworth Report agrees with the Percy Report as regards the lack of supply of able people at the highest level, but coming as an outsider to the Heyworth Report, I must observe that, considering the increasing demands for skilled personnel at all levels, with the expansion of industry, especially attractive industries such as radio and plastics, together with declining population, paragraph 159 of the Heyworth Report strikes me as rather complacent. One may well add, when will times be *normal* again ?

Importance of Advisory Committees

In all such courses industry must help, as it only can, in the selection or recruitment of teachers. Consultation between industry and commerce will still be needed at the local as well as at the regional and national levels. I would commend the well-tried idea of Advisory Committees such as we have at my college which, acting as a common meeting-ground for local industry and education, have been instrumental in establishing part-time and full-time day courses since the return from evacuation in 1942. I would like to take this opportunity of acknowledging the help given by Mr. H. M. Royle, M.I.Mech.E., who is a member of the Engineering Advisory Committee and has been its Chairman. Perhaps I may read the Terms of Reference of our Advisory Committees, which I would commend to your notice:

(*a*) To advise on courses of instruction and syllabuses of work in those branches of study covered by their designation, in order to ensure that the work of the College and the equipment provided are in harmony with the best practice of industry and commerce.

(*b*) To act as points of contact between the College and industry and commerce, and to encourage co-operation between employers and the College.

(*c*) To advise and assist in—

The recruitment of students for classes.

The placing of students (more especially those of the full-time Departments of the College) in suitable posts.

(*d*) To visit the classes of the College.

(*e*) To establish, where desirable, funds for the award of scholarships and prizes and generally to encourage capable and deserving students.

One could add a further term of reference covering the great need for industry to help in staffing specialized courses, both evening and the more difficult part-time day release of senior staff.

In such ways we shall not only increase technical education in duration and quantity, but in quality. Speaking from the point of view of the teaching profession we shall need to be vigilant in the raising and maintenance of standards. Perhaps our most difficult and continuing task will be to enable students to think clearly, to inculcate a scientific attitude in them, and to promote a steadfastness and surety of judgment with adaptability in action. All of these are qualities indispensable to the solution of our problems, and to our progress, industrially and socially, and they will only be secured through courses planned and established through the harmonious co-operation of education and industry.

DISCUSSION

The **Chairman** (Mr. G. L. Braidwood) said the Author had emphasized both to staff and pupils the importance of relating their studies to the social community in which they lived, and he was keen on the relationship between vocational training and the job itself and its importance in the social and industrial community. It was imperative to consider the psychological aspect of the relationship between training and the world in which they lived. The present time was a crisis in the age of man, and they were faced with the naked alternatives of " co-operate or perish." That was largely due to the fact that scientific achievement had outstripped man's ability or willingness to order his economic affairs properly, combined with the fact that his sense of moral obligation had deteriorated, all of which came back to education. The present parlous state of the world was due to lack of education, and bad education. This was also an age of cynicism, but that was probably better than the false optimism which followed the 1914–18 war. The scientific approach was apt to be over-emphasized, and he also felt there was too much emphasis on specialization. To approach the subject of education from the right angle, it was desirable to attempt to analyze existing faults, and consider how they might be remedied. In commenting on education he was criticizing, not those who had had no proper education, but those who were supposed to have been educated, but things were getting much better. The new Education Act was an enormous advance in the right direction, and young people to-day seemed to take a greater interest in current affairs and in what was going on in the world around them than they did at the time of the first great war. He had no patience with the specialist attitude which prompted a man to say he was a doctor, or a gas engineer, and took no interest in political economics in their fullest sense. Britons as a whole had plenty of ability, but judged by the workmanship of other nations they were more inclined to be lazy. We were easy going, and that led in some cases to slipshod methods. We were in some respects bad organizers, but we could organize in a big way when wartime necessity arose. In the past in industry generally one would say there had been a great deal too much emphasis on money-making, and our sense of social responsibility had been lacking. He also thought our sense of values was sadly out of proportion, and would like to see a return to ethical standards, with the ordinary person having some knowledge of the great masters and a little less enthusiasm for film and football stars.

Three Essentials

In industry in general there was unreliability in the ability to repeat and execute orders properly. Too many people in industry were out to do as little work as possible—which was apparently a legacy from war troubles and trials and from bad times in the past. There was a loss of pride in craftsmanship, to some extent due to modern mass production methods, and in the care of other people's property. There was lack of initiative, due, not to any argument about private enterprise *versus* State control, but to the over-mechanized age. Any job worthy of the name should fulfil three requirements: it should afford adequate pay and leisure; it should be capable of being performed in reasonable conditions of comfort and hygiene and be interesting; and it should be of benefit to the community. There was a general recognition in the Gas Industry that conditions must be improved, and there had recently been published by the National Joint Industrial Council a workmen's charter setting out details of holidays with pay, sick benefit, six-day week for shift workers and so on. In his view the main faults in the Industry had been its lack of uniformity in standardization and of a coherent policy, a lack of adequate salaries for its executives, and the fact that its public relations had not been as effective as they might have been. As to salaries, many people had spoken very plainly, but the fact remained that the salaries offered for many of the jobs advertised to-day were grossly inadequate, and until that was adjusted the Industry would not get enough men of the right calibre.

Too many people regarded the Gas Industry as being out of date and declining, and that in turn affected the intake of recruits into the Industry and the whole subject of careers. In that respect one was glad to notice the measures recently taken by Colonel Croft, President of the Institution, in inviting public school careers masters and a party of schoolboys to visit his works. It was also satisfactory to note that the Careers Committee of the Institution was getting out a Careers Handbook which he hoped would receive wide publicity. The publicity recently accorded the Industry had been of the wrong type, but it had been pretty powerful. One notable exception was a recent article in a picture paper under the heading, "It's fun to be a gas fitter," which must have done a considerable amount of good. The Industry was essentially a social service, and in connexion with education of young people emphasis should be placed on the smoke abatement aspect and also on that of national fuel conservation. Members would have noticed from the Board of Gas Examiners' report that those two matters did not seem to have been stressed. As a member of the District Education Committee he was well aware that conditions in the immediate future appeared to be anything but rosy. Many of the technical colleges were not yet functioning. There was a shortage of technical staff, and therefore of teachers in the Industry. There was a very bad shortage of paper and therefore of books, and it was regrettable that in such an Industry the technical members did not have the benefit, as in other learned societies, of having available

a selection of abstracts and indexed records of all published information. The lack of such facilities must inevitably increase the waste of time and the duplication of work when people were trying to find out something already discovered elsewhere.

Part Time Classes at Brighton

Mr. **J. H. C. Bates** (Brighton), speaking of part-time day releases for students, said that at Brighton the education authority already had such an arrangement, and there were now 1,500 students being released by engineering firms to attend part-time classes. The classes had been extended from the ordinary engineering side to heating and ventilating engineering, and also to gas engineering. The students on the gas side were released for one whole day per week. The scheme had been working well for 18 months, and was showing good progress. inasmuch as all the local engineering firms were supporting it well, He thought it was difficult to deal with vocational training in terms of the various industries, and he wondered whether the Author envisaged a general training of the mechanical engineering type. The question of vocational training was important, because young people coming into engineering to-day were lacking in regard to mechanical ability.

Dr. **Venables** disagreed with the Chairman's suggestion that the present generation was suffering from over-mechanization, and said one of his difficulties was to persuade people to be sufficiently scientific in outlook. Most of to-day's troubles could be more easily resolved if people were more scientific. The question of the kind of education for people going into industry and how it should be related to what they were going to do raised the problem of aptitudes. The Education Act required separation at 11 years of age, the idea being to allow three years before reaching the old leaving age of 14. If the leaving age was raised to 15 or 16 the age for the change should be raised to 12 or 13. It had been established that aptitudes did not begin to show themselves until 13 or 14 years of age. There was a great need for an extension of aptitude tests for the selection of people going into industry. Assuming a boy had practical ability and assuming he had chosen to be an engineer, he should be given from the age of 13 a three-year course, in the first year of which about two-thirds of his education should be general and one-third vocational training, in the second year half and half, and in the third year one-third general and two-thirds vocational.

Mr. **R. N. LeFevre** (Gas Light and Coke Company) said we were very far from being scientific in our methods at the moment, and as one who had had experience of aptitude tests he would like to see them extended very much further. His one quarrel was that it was left to industry to make those tests, and the education authorities were doing very little in the matter. He would like to see new entrants coming in with full records of their school or other previous education. They could still have their own tests, but such records would help them to decide which avenue each student should pursue. There was a psychological point in impressing upon students the necessity for doing some things for themselves. They were apt to think that with all the training facilities afforded there was very little left for them to do themselves. He thought that in addition to daytime studies students should be encouraged to avail themselves of evening classes, possibly starting with one night per week and increasing to three nights per week at the age of 21, plus one day per week.

Dr. **Venables** agreed that the old type of report form should go, and they should have a five-point scale introduced so as to assess things properly. There must be training on the works. Anybody who imagined that the technical colleges could do everything was a fool. Most of his pupils did one day per week in their employers' time, and one evening a week in their own time, and it must be clearly understood that under the new Act it would not be possible to require them to do that—though they could volunteer.

Facilities Well Worth While

Colonel **J. A. Gould** (South Suburban Gas Company) said his Company had recently arranged a series of instructional classes for gas fitters' boys, and he persuaded one of his assistants to take them in arithmetic and elementary drawing. He had been impressed by the very poor standard of knowledge possessed by those boys. The Author had referred to the fact that Industry should make some effort to release people to instruct students, particularly at present when so many people were coming out of the Forces. The District Education Committee had that matter very much at heart, particularly as, probably as the result of the war, the London companies had found it impossible to supply students, and London therefore had no special arrangements for getting young men back quickly into the Industry. On the question of amenities and facilities, they had found that any facilities a gas company could provide in the way of materials and so on to enable their people to be trained were amply repaid by the results.

Dr. **Venables** said he felt the release of teachers for post-war courses was vital, and many people would need re-training. During the war they gladly undertook the training of peace-time workers for war jobs; surely they could also see to the training of war workers for peace-time occupations. The question of amenities struck right home to him because he lived in a seaside town, and he could say that if the college was as well equipped and as comfortable as any of the local picture halls they would have no difficulty at all in finding students.

Mr. **Wright** (Uxbridge and Slough), just back after over six years in the Army, said he was particularly interested in the question of vocational training. He hoped that improvements in education would also bring improvements in discipline, which should spring from the boys themselves. There was a grave lack of it in present-day boys entering the Gas Industry. In his war-time experience he had been responsible, for a large part of his time, for training in gunnery, and he was convinced that to get results two things were necessary—to select the right men for the right jobs, by means of intelligence tests, and to get the right teachers who were highly specialized. As regards the selection of the right men, as time progressed they had less chance of getting the high intelligence they needed. They had to accept for highly technical jobs men who would normally be deemed unsuitable, but they offset that by improving the standard of teaching. In the matter of vocational training where industry had to provide the teachers it was important that they should be good ones. As a basis for any education scheme they must first train their teachers. Another matter that worried him with regard to the future was the question of the standards demanded by various Institution examinations. They were rightly getting higher in some ways, but they were getting higher in the way of book-learning, without becoming higher in the sense of civic duty and loyalty to a particular industry.

Teachers Must Be Trained

Dr. **Venables** agreed that the question of teachers was important. In technical education they must have a wide range of teachers, and it was no use for any academic graduate to hope to "swat up" a subject overnight. The people to impart technical education were those who had earned their living at jobs and then came to teach others. At the same time it did not follow that an accomplished technician would make a successful teacher. The Ministry of Education had realized the need, and had set up six and twelve months' courses for training technical teachers. Technical education would be impossible without technical men trained to be teachers. With regard to the standards demanded by Institutions, most of the professional bodies had in the last two or three years been examining critically their regulations and syllabuses. The need for relating those standards to the new standards in industry had been thoroughly considered.

Mr. **LeFevre** said that in regard to the training of teachers he would like to see every teacher in the technical institutes taking a proper course, such as that laid down in the T.W.I. scheme.

Dr. **Venables** said there were limits to the intensified short course. At his own college they had been conscious of the fact that of the staff of about 100 many had never been shown how to teach. They had run a training course for such teachers during the summer terms, and the difference had been considerable.

Mr. **Bates** said the question of the choice of career for youngsters leaving school was a serious problem. There was always difficulty in recruiting youngsters from the ordinary elementary schools and the secondary schools. So far as the secondary schools were concerned, it had always been difficult to get the youngsters interested in the Gas Industry. One reason was that some people had an idea it was a dying industry. Regarding secondary education, it was obviously intended to establish a higher standard of training on the mechanical side. In the elementary schools there was difficulty in getting the Gas Industry story over, and they had to do it by devious methods. Through his own membership of the local education committee and juvenile employment committee he had had opportunities of interviewing some of the boys at school-leaving time, but quite frankly that was not the way it should be done. It should be possible for any industry to put over a fairly good story of its operations to give at least an idea of what engineering in all its various aspects meant. One school had introduced speakers from the different industries, and in one case, following a visit by a member of the cinema industry, 75% of the boys intimated that they wanted to become cinema projection operators.

Dr. **Venables** said that great care was always necessary to see that there was fair play, rather than propaganda, in explaining industry to young people. He was a great believer in the use of films in that connexion, and a film committee had been set up to consider the question of the use of films in schools.

Mr. **L. Muir Wilson** (South Metropolitan Gas Company), in a written communication, said there were some points on education which need consideration. We too often heard it stated that the object of education was to teach people how to earn a living; this technical education should do, but the fundamental object of all education should be to teach people how to live. If we started science and technical education at too early an age, or relegated history and the humanities too much into the background, we might only succeed in teaching folk how to kill instead of how to live. Religious instruction seemed to have been more or less dropped, perhaps because the various religious bodies could not agree among

themselves on a line of instruction suitable for the mixture of denominations which attended Government schools. The Old Testament gave many warnings of the dangers of tyranny and various forms of bad government which cropped up as new from time to time to the detriment of the governed. The Greek States tried nearly every form of misgovernment, so the study of their history up to the time of Philip of Macedon might form a useful and instructive study for budding electors. To-day we believed that society should be so regulated that the best men should come automatically to the top; no one quarrelled with this. But things were turning out so that the prizes went to the straightest shots and the most nimble climbers up the tree of success. There was reason to doubt whether such people were fitter to govern than their more serious and thoughtful comrades who persevered at their daily toil.

A ready memory and a quick tongue carried far too much weight in this world. For this, the laziness of examiners and their examination papers were much to blame. It saved a lot of trouble to set the type of question which could be answered straight from the book. "State Hogwashe's Theorem," "Write out Professor Strabismus' Formula" and the like. All this sort of stuff could be dealt with by cramming up the night before the examination and was just as easily forgotten. Students should be allowed to bring any books they liked in with them to the examination and be called upon to show, as they would in real life, that they understood what was in the books and knew how to think. The questions should be problems of a type likely to crop up from day to day in a gas-works. Any sensible answer should gain marks, which would admittedly be difficult to allocate. This would be a severe test on the examiner. W. E. Gladstone found time to translate the *Iliad* into almost perfect English verse. He would turn in his grave should he read the "Jobs Vacant" pages of our technical papers. Our Industry needed men of broad outlook, character and wisdom, but at the salaries offered we were only likely to recruit young men who had struggled through unimaginative examinations, and spent so many years of their lives watching wheels go round.

Dr. **Venables** wrote in reply that Mr. Muir Wilson's remarks covered such a wide range of matters on education, as distinct from education and industry that it was impossible to comment on them. Some of them he agreed with; others he disagreed with profoundly, and he disliked the denigration of scientific education in favour of education deriving solely or mostly from that desirable in the ancient Greek city states, which, after all, were based upon a slave civilization. He thought the need of the age was to create a new philosophy of education, on which all our work should be based; it should be a synthesis of the humanistic and scientific traditions. He strongly resisted any implication that these two traditions were mutually exclusive.

On the motion of Colonel **Gould**, seconded by Mr. **F. Dawson**, a vote of thanks was accorded to Dr. Venables for his Paper.

Utilization of Waste Heat in the Carbonizing Industries

By Dr. J. G. KING and Dr. F. J. DENT

A "Gas Journal" Abstract of a Paper presented to the Institute of Fuel on Industrial Waste Heat Recovery. The Paper was first put forward at a Joint Meeting of the Institute with the Midland Section of the Coke Oven Managers' Association. Subsequently it was presented at a meeting of the East Midland Section of the Institute of Fuel at Nottingham on Feb. 21.

In Great Britain some 20 million tons of coal are carbonized annually in the gas-works and a like amount in coke ovens. Both processes involve heating the coal at about 1,000°C., and as the quantity of fuel consumed is considerable, the exit gases contain an amount of heat equivalent to several million tons of coal. Systems of heat recovery are well established in both industries, and a high level of efficiency is attained.

On the gas-works, settings are usually fired by hot producer gas, and recuperation or regeneration must be limited to heat exchange between exit gases from the combustion chambers and secondary air, the heat capacity of which is insufficient for recovery to be complete. Waste-heat boilers are often used in addition. Steam raising, however, must be kept in relation to works requirements, and to the extent to which breeze is used for this purpose. Birks, with large works in mind, believes that steam raised by waste heat recovery should be limited to the night requirement of the works, which is generally about half that of the daytime. (See F. M. Birks, *Trans.*, 1934, **127**, 5.)

In the coke industry, coke being the principal product, ovens are heated either by part of the coal gas also produced or, if associated with steelworks, by surplus blast-furnace gas. In both cases heat recovery in regenerators is so complete that further recovery by waste-heat boiler is impracticable.

Carbonizing Systems

In the Gas Industry the following proportions of town gas were made in the several systems in use in 1938:

(*a*) Horizontal retorts . . .	28%
(*b*) Continuous verticals . .	48%
(*c*) Intermittent verticals . .	12%
(*d*) Coke ovens	2%
(*e*) Water-gas plant . . .	10%

In (*a*) heat is recovered from the waste gases by recuperators with or without waste-heat boilers. In (*b*) modern installations use only waste-heat boilers, with some air pre-heating from the brickwork of the setting. In (*c*) recuperators and waste heat boilers are still used. In (*d*) regenerators are used with settings fired from external producers. In (*e*) steam in relatively large quantities is used in the gas-making process, and heat from waste gases is recovered in a waste-heat boiler, air being added before the boiler to complete combustion.

Horizontals

In the Paper a diagrammatic drawing and brief description are given of a setting of 10–21-in. by 15-in. retorts 21 ft. long in five tiers with the usual built-in producer and recuperator consisting of parallel flues for waste-gas egress and secondary air ingress in counter-flow. Such retorts would be charged with 12 cwt. of coal every 9–12 hours. The setting is designed to secure even heating with the minimum excess secondary air. Assuming 10% excess as a reasonable standard and 115 B.Th.U. cu.ft. as the net calorific value of the producer gas, 2.16 vols. of waste gas (19.4% CO_2) would be produced per vol. of secondary air. The maximum theoretical transfer of heat to air would be $(1.1 \times 0.34)/(2.16 \times 0.37) = 47\%$. 0.34 and 0.37 being the specific heats of air and waste gas respectively. In practice, with waste gases entering the recuperator at about 1,000°C., the secondary air might be heated to about 800°C. and the heat recovery would be about 37%. With 10% excess secondary air, the waste gases would leave the recuperator at about 600°C.

"For a modern recuperative setting, Birks gives the heat (potential and sensible) of the coke supplied to the producer as 42.0 therms per ton of coal carbonized, and the heat of the waste gases at the outlet of the recuperator as 14.6 therms. Assuming the recuperator pre-heats the secondary air (10% excess) to 800°C., it can be shown that 9.0 therms are recovered thereby, so that the heat in the waste gases entering the recuperator can be taken as 23.6 therms. Thus per 42.0 therms supplied as hot coke to the producer, $42.0 - 14.6 = 27.4$ therms are made available for carbonization, whereas in the absence of recuperators the heat available would have been only 18.4 therms. Without recuperation the therms required in the producer would therefore have been $42.0 \times 27.4/18.4 = 62.5$, the reduction to 42.0 therms by recuperation representing a saving of 33% of producer fuel."

The waste-heat boiler following the recuperator is generally of the fire-tube type, through which the gases are drawn by a steam-driven fan at a sufficient velocity to ensure turbulent flow, the temperature of the gases being reduced to 240°C. at the exit of the boiler, this temperature being the safe minimum to avoid corrosion troubles due to the deposition of sulphuric acid. Efficiency is seriously affected by air leakages, whether within the recuperators or by ingress through cracks in flues and at observation points. Leakage is indicated by a drop in CO_2 content. A reduction from 19.4% to 13.4% CO_2 may reduce boiler efficiency from 60% to 46%.

Under good conditions, with an inlet boiler temperature of 600°C., the amount of steam raised is 850 lb. per ton of coal carbonized, equivalent to 2.8 lb. per lb. of coke to producers. Assuming 8 lb. of steam raised per lb. of coke breeze in a chain grate stoker boiler, the steam thus raised is equivalent to a saving of fuel on the works (not in the settings) of 106 lb. coke per ton of coal carbonized.

Analyzing the thermal balance set out it appears that the efficiency of the hot-gas producer is about 85%, which is probably not capable of much improvement. Radiation from the setting has been reduced to a practical minimum by efficient construction and insulation. Heat in the crude coal gas is recoverable to a small extent by using cooling water from the condenser as boiler feed—0.9 therm per ton of coal carbonized in the example given. Heat recovered in the waste-heat boiler amounted to 5.5 therms. Sensible heat in the hot coke represents 20% of the fuel used. One-fifth of this is recovered by charging

hot coke to producers. A further three-fifths can be recovered by dry-cooling and is referred to later.

The following table sets out the heat balance in a new form.

HEAT RECOVERED IN A RECUPERATIVE SETTING OF HORIZONTAL RETORTS. (COKE TO PRODUCER, 40 THERMS = 2.75 CWT./TON OF COAL, OR 13.8%.)

	Therms per ton of coal.	Coke equivalent (cwt.).
Sensible heat in coke:		
Recovered in producer	2.0	0.31
Lost	8.5	...
Sensible heat in crude coal gas:		
Recovered in boiler feed	0.9	0.09
Lost	4.8	...
Sensible heat in waste gases:		
Recovered in air preheat	9.0	1.40
Recovered as steam (850 lb.)	9.1	0.90
Lost	5.5	...
		2.70

It will be seen that heat recovery results in a saving of 2.7 cwt. coke per ton of coal carbonized, so that if heat recovery had not been employed fuel consumption would be 5.45 cwt. instead of 2.75 cwt. per ton of coal (27.3 instead of 13.8%).

Regeneration has been used in an experimental setting of horizontal retorts built by the South Metropolitan Gas Company. The setting was fired by coal producer gas, both gas and air were pre-heated, and the waste gases were so far cooled that further heat recovery by waste heat boiler was obviated. Steam raising was limited to a jacket-boiler on the producer and a waste heat boiler in the producer gas stream. The thermal balance and other data are given in the Paper.

Waste gases being cooled from 1,100° to 350°C., producer gas and secondary air returned approximately 70% of their sensible heat to the setting. The temperature of the secondary air leaving the regenerators being 840°C., the amount of heat involved was 24 therms per ton of coal carbonized. The recovery of steam was equivalent to 353 lb. per ton of coal, 167 lb. of this being required for blast saturation. The coke consumed was 18.6 lb./100 lb. coal (52 therms/ton), and the only credit was the 186 lb. of surplus steam. The high radiation loss of 16.5 therms was due to the setting being an isolated section. With a normal bench it would be no more than 7 therms and the overall fuel consumption would have been 14–15 lb./100 lb. coal, comparing reasonably well with a recuperative setting, although the latter would return more steam (850 lb.).

The South Metropolitan Gas Company has also experimented with a full bench of horizontals with recuperation eliminated and waste-heat boilers as the sole means of heat recovery. Data given show a fuel consumption of 15.6 as against the 13.8 in the usual design. Surplus steam was increased from 850 to 1,370 lb./ton of coal, the additional 520 lb. steam being thus obtained by the combustion of an extra 40.3 lb. coke—*i.e.*, at the rate of 13 lb./lb.

Data obtained from an experimental setting (horizontals) at the Fuel Research Station indicate that 58% of the loss of heat by radiation takes place at the metal doors (mouthpieces).

The Continuous Vertical Retort

"From the point of view of heat exchange the continuous vertical retort differs fundamentally from static carbonizing systems in providing an opportunity for imparting heat to the incoming coal and abstracting heat from the outgoing coke. Apart from any consideration of recuperation from waste gases, therefore, the fuel consumption is inherently lower in consequence."

The heating system is shown diagrammatically in fig. 1 (Glover-West) and fig. 2 (Woodall-Duckham). Heat is recovered from the waste gases leaving the setting mainly by the waste-heat boiler with some pre-heating of secondary air, recuperators having been abandoned in all current designs. Recuperation nevertheless occurs in other parts of the setting. First, secondary air is pre-heated to 350° by passing through the lower flues, along ducts around the ironwork, &c., amounting to 7% of the heat input to the setting and resulting in a reduction of 15% in coke to producers. Secondary air is further heated to about 700° by conduction from the hot producer gas flue and the retort bench brick-work.

"The extent to which this further pre-heating represents a saving of heat depends upon how much of the heat taken up by the air from the setting would otherwise be dissipated. That some of it is merely a transfer of heat within the system is quite clear, but a proportion, though perhaps small, can be regarded as recuperation."

Secondly, waste gases circulating around the tops of the retorts pre-heat the incoming coal before leaving the setting at about 900°C. The flow of coal is counter-current to that of the heating gases. The effect of this coal/waste gas recuperation is not readily calculable.

Thirdly, steam introduced into the coke chamber and passing up through the charge reacts with the coke to make water gas, thus cooling the coke. This reaction becomes very slow below 850°C. It cannot, therefore, be effective in cooling the coke below this temperature, but the pre-heating to 850° of steam equivalent to 5% by weight of coal carbonized will further cool the coke to 785°C., and 10% steaming will cool it to 725°C. Pexton calculates that 2 therms are recovered per ton of coal carbonized (making 14.5 cwt. coke) by the water-gas reaction, 0.75 in pre-heating the steam (cooling the coke to 785°C) and a further 3 therms by cooling to 550° by transfer to secondary air—a total of 5.75 therms recovered at the base of the retort. The steam has the further effect of cooling the coke chamber and reducing loss by radiation at the base of the setting.

Birks' thermal balance of continuous verticals carbonizing Durham coals with 10% steaming is given. It shows a fuel consumption of 12 lb./100 lb. coal carbonized, "rather higher than the 11.3 lb. given by S. Pexton for slight steaming." The low figure for loss by sensible heat of coke (2.0 therms/ton coal) corresponds to a discharge temperature of about 250°C. Pexton gives 650°C. corresponding to 6.0 therms, but probably refers to temperature of discharge into coke chamber. Which figure is taken is not important, since the difference adds to the radiation losses, and in either case the sensible heat in the coke is insufficient to justify heat recovery by a secondary process.

The sensible heat in the waste gases is given as 18.1 therms, and that of the gases leaving the boiler, 5.2 therms, corresponding to an efficiency of recovery of 77.5%. The total steam produced was 1,580 lb./ton of coal carbonized, equivalent to 15.3 therms. The final yield of steam surplus to the system is 12.8 therms or 1,320 lb./ton of coal, equivalent to 5.21 lb./lb. of coke to producers. The importance of reducing air infiltration to flues is emphasized by quoting W. Gregson, who shows that the efficiency of recovery is reduced from 74.2 to 70.4% when excess air at boiler inlet rises from 50 to 100%.

In "Static Verticals" (West's and Woodall-Duckham) the coke is steamed so that it is cooled to about 400°C. before discharge, water-gas and pre-heated steam rising through the fresh charge of coal. "It is not yet possible to assess the fuel requirements of such a system, or to determine how the results of this improved heat-interchange compare with those of the older systems."

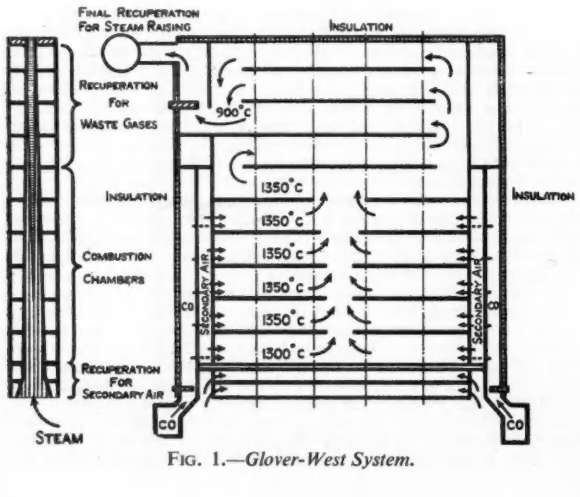


FIG. 1.—*Glover-West System.*

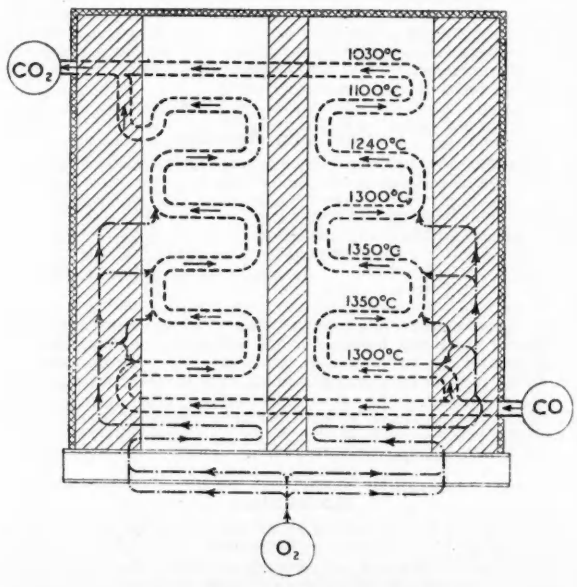


FIG. 2.—*Woodall-Duckham System.*

The Intermittent Vertical Chamber

In the system described and illustrated in the Paper a 3½-ton charge is carbonized in about 12 hours, with steaming during the last 1 or 2 hours. Coke is discharged hot and, including producer fuel, is quenched externally. Most settings are built with recuperators, followed by waste-heat boilers. The total surface exposed for air-heating is about 50 sq. ft. per 1,000 cu.ft. (NTP) of air per hour and the air velocity is about 1 ft. per second.

The efficiency of heat recovery is shown in results of tests carried out at Croydon by F. J. Dent and others on a bench of 36 chambers, in which 3.75 tons of Durham coal were carbonized per chamber in 12 hours—2 hours' steaming making gas at 550 B.Th.U./cu.ft. with carbonizing temperatures 1,300° at the bottom to 875°C. at the top. A thermal balance shows that 292 lb. (37.7 therms) of coke was supplied to the producers per ton of coal carbonized. The loss of heat in the hot coke was 9.5 therms; radiation and convection losses from the setting, 5.2 therms. The data relevant to the transfer of heat from exit gases to secondary air and steam are the temperatures at the upper combustion chamber 876°, upper recuperator flue 810°, exit recuperator 610°, inlet boiler 570°, outlet boiler 240°, and secondary air 675°. The CO_2 content of the waste gases fell from 19.4 to 18.2% passing through the recuperator, indicating 9% leakage of air into the waste gases. Calculating on that assumption the secondary air gained 6.0 therms sensible heat, while the waste gases only lost 3.5 therms plus 0.8 therm, due to combustion of traces of CO and H_2. It is inferred that the balance of 1.7 therms is obtained by conduction through the producer walls. This transfer of heat may or may not be desirable, but it is certain that if the producers had outside walls some of this heat would be lost by radiation. Assuming the secondary air carries 6 therms back to the system, this represents 16% of the heat-value of coke to producers, and since its use does not involve waste gas losses it is equivalent to a fuel saving of 25%.

The thermal efficiency of recovery in the waste heat boiler (51%) is normal, the amount of steam raised being 548 lb./ton of coal carbonized, or 1.87 lb./lb. coke to producers. Deducting steam to drive the fan leaves 248 lb. for works purposes. From a non-recuperative setting 1,100 lb. steam would be raised, leaving 900 lb. surplus per ton of coal carbonized.

The Water Gas Process

Water gas is made by passing steam through hot coke in a generator, which in most modern plants is automatically operated and fitted with a jacket boiler. The decomposition of steam and oil, when this is used for enrichment, absorbs heat from both the coke bed and the oil-cracking chamber. This heat is replaced by periodically interrupting the flow of steam and oil and blowing air through the coke bed. The importance of heat recovery is immediately apparent when it is realized that during the blow period less than 50% of the coke burnt remains in the fuel bed, the remainder leaving the generator in the blow gases. But the heat in these gases is not only their sensible heat; most of it is potential heat as CO requiring secondary combustion for its liberation. CO tends to increase, with loss of efficiency, as output is raised, but modern plants are designed so that higher output can be obtained without more heat in the blow gases than can be usefully recovered.

In the blue water-gas process the total heat required as steam is equal to 0.308 therm per therm of B.W.G. made; 0.101 of this is supplied by the generator boiler. Without heat recovery from blow gases, additional steam being raised at 70% efficiency in external boilers, the thermal efficiency of gas making would be—

$$\frac{1}{1.555 + (0.308 - 0.101)/0.7} = 54.1\%,$$

1.555 being therms in coke to generators per therm of gas made. If heat recovery makes the plant self-supporting in steam, the efficiency would be 1/1.555, or 64.3%.

A thermal balance shows that the potential heat in the blow gases is 0.248 therm and the sensible heat 0.118, a total of 0.366 therm. Other wastages are 0.042 sensible heat in the water gas and 0.026 in the undecomposed steam, making the total loss 0.434 therm, of which 0.207 (0.308–0.101) must be recovered to make the plant self-supporting.

Certain features of the recovery methods require explanation. In the secondary combustion of the blow gases in the recuperator account has to be taken of the fact that CO increases in each blow period as the temperature rises; 5 to 15% in the example given. The rate of supply of secondary air is therefore controlled by a valve gradually opened by a suitable cam, good mixing being achieved, in one design, by admitting the air through a number of ports being generator and recuperator.

During the run, part of the B.W.G. and undecomposed steam leave the top of the generator at 550° to 600°C. and part from below the grate at about 230°C. The latter temperature is too low for heat recovery; but the uprun gases pass through the recuperator and the boiler. Their heat content is 0.050 therm/therm of B.W.G. at outlet generator and 0.020 at outlet boiler, in which 0.030 therm is thus recovered. The corresponding figures for the blow gases are 0.316, 0.074 and 0.292, making a total of 0.322 total heat recovery less 0.020 radiation and convection losses, or a net 0.302 against the requirement of 0.207, thus providing ample steam to make the plant self-supporting.

In the carburetted water-gas process the heat in the blow gases is used to decompose the oil as well as to raise steam for the process, but the levels of temperature at which heat must be liberated are different in the two cases. Oil-cracking at 750 to 800°C. must be carried out first. A high overall efficiency depends upon balancing the process as a whole, so that the waste gases leaving the carburetter and superheater do not contain more heat than can be usefully recovered as steam. Uprun gases from the C.W.G. process contain some tar and cannot be passed through the waste heat boiler. With generators using mechanical grates and jacket boilers the amount of steam required from the waste-heat boiler is reduced. Steps are therefore taken to increase as far as possible the proportion of the heat of the blow gas liberated above the temperature of oil-cracking. These are, (1) to mix secondary air thoroughly with the blow gas to obtain a high efficiency of secondary combustion, (2) to confine oil-cracking to the uprun, obviating heating the cooler downrun gases to the cracking temperature, and (3) to return to the generator part of the sensible heat of the blow gas and carburetter gas by steam backwards through the superheater and carburetter ("backrun steaming").

Heat recovery is mainly confined to the treatment of the blow gas. In a typical example, making town gas at 450 B.Th.U./cu.ft., the total heat in blow gas leaving generator was 0.394 therm per therm of blue water gas made. Of this, 0.055 was absorbed in oil-cracking and 0.016 was required to raise uprun B.W.G. to the temperature of oil-cracking. Heat recovered from blow gas by backrun steam was 0.029. The waste-heat boiler absorbed 0.184 therm, leaving 0.090 therm in the blow gas at exit boiler.

The thermal balance of the whole process is exhibited in the Paper. The potential heat in the C.W.G. was 1.612 therm per therm of B.W.G. made. Coke to generators was 1.555 therm as before, steam for gas making and auxiliary plant represented 0.330 therm and oil 0.815 therm. The plant was not quite self-supporting in steam, 0.101 therm being raised in the jacket boiler and 0.814 recovered in the waste heat boiler—a total of 0.285. Thermal efficiency of gas production, with waste-heat boiler and allowing for the tar (the heat content of which was 0.190 therm), was thus:

$$\frac{1.612}{1.555 + 0.815 + (0.330 - 0.285)/0.7 - 0.190} = 71.8\%.$$

Without the waste-heat boiler it would have been 64.3%. In the case of C.W.G. plants used for peak-load purposes only, the increase in capital expenditure for the provision of a waste-heat boiler is not considered justifiable, and generally only plants with a daily capacity of 1 million cu.ft. or more would be so equipped.

The Coke Oven

Coke ovens for the manufacture of metallurgical coke are heated either by part of the coal gas made or by blast-furnace gas when this is available. Since coal gas has found a market as town gas, recovery of the heat in the waste gases has become profitable. The method adopted is regeneration by secondary air, or by air and gas when blast furnace gas is used, the latter being essential to pre-heat this "poor" gas to reach the required flame temperature in the combustion chambers. So far, only one battery of coke ovens has been built for the direct manufacture of town gas; the fuel used is cool, cleaned gas from external mechanical producers.

The fuel requirements increase with the moisture content of the coal carbonized, while the quantity of gas produced depends on the volatile content of the coal. The application of regeneration is therefore particularly necessary when treating a coal high in moisture and low in volatiles. A non-regenerative (or waste-heat) battery of ovens might have no surplus gas when treating a coal with 20% volatiles and 12% moisture.

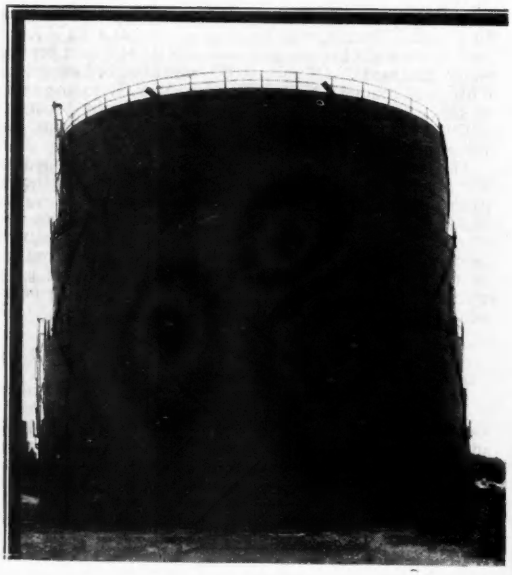
In average practice fuel consumption lies between 22 and 25 therms per ton of coal carbonized for regenerative ovens, and 45 and 50 for waste-heat ovens. The first factor of importance to the efficiency of regeneration is the ratio between the volumes of secondary air and waste gases. With 25% excess air the ratio is 0.87 for rich gas and 1.02 for blast furnace gas, representing very different conditions from those in systems fired by producer gas when only the secondary air is heated with a heat capacity only half that of the waste gases. In practice the waste gases are cooled from about 1,100°C. to about 260°C. while the air is heated to 1,050°C. Measures of heat lost by radiation and convection from the regenerator indicate that 99% of the heat lost by the waste-gases is taken up by the air. The efficiency of radiation is of the order of 78%. Experience has shown that while regenerative ovens can be heated by 1,000 to 1,100 B.Th.U. per ton of coal carbonized, non-regenerative ovens require twice as much when carbonizing the same coal. Waste gases leaving the regenerators at 260°C., still containing one-fifth of their sensible heat, it is impracticable to recover this at so low a temperature, but since this heat provides chimney draught it should not be considered entirely wasted. On the other hand, 11.3 therms are lost in sensible heat of coke and 6.1 in the crude gas. The former can be recovered down to about 300°C. by dry-cooling, in which 770 lb. of steam can be raised. The high loss of heat in the crude gas is due to the relatively high temperature, 500–600°C., at which the gas leaves the ovens.

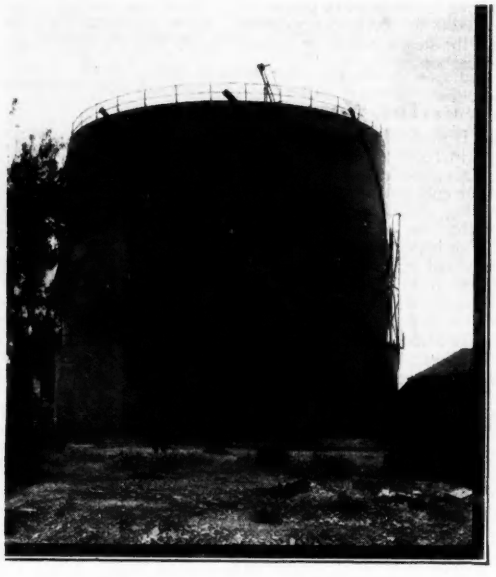
(*Continued on p. 440*)

ADDITIONAL STORAGE CAPACITY

may *not* necessarily involve additional ground space.

If faced with this problem have you examined the possibilities of increasing your Holder capacity within the original tanks?





These Gasholders, with capacities of 336,217 and 147,100 cu. ft., replace two single-lift Holders of 95,000 and 50,000 cu. ft. respectively. Thus, the total storage capacity of these two units has been more than tripled without additional ground space, and utilising the existing tanks.

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COMPANY MEETINGS

Cambridge Gas Company

The ordinary general meeting of the Cambridge University and Town Gas Light Company was held at Cambridge on Feb. 22, Mr. J. F. Cameron presiding.

The **Chairman,** in moving the adoption of the report and accounts, said: Our expenditure has reached the new high level of £327,000, an increase of 50% over the expenditure for 1939, and an increase of over £15,000 over the corresponding figure for 1944, although the incomes for the years 1944 and 1945 are substantially the same. During the whole of the war period costs have been rising, and they have been very substantially greater in 1945 than in 1944—for wages, for coal, where our raw material has cost us £11,000 more, and for all our purchasable requirements. There has been only partial compensation in the higher price of coke and other residuals. One factor which, apart from the level of costs, will affect our expenditure for some years to come is the cost of overtaking work which would already have been done if war conditions had allowed. In view of all the circumstances it is not surprising that your Directors found it necessary to apply to the Ministry of Fuel and Power for leave to increase the price of gas. We regret the necessity for this action, which we postponed for as long as we reasonably could.

On the production side the year has not been without its anxieties. Coal supplies have been very short, and it has again been necessary to conserve coal by manufacturing high proportions of water gas, and a record quantity of gas oil has been used during the year to enrich the water gas.

A greater shortage of labour has been experienced during the autumn than at any time during the war, and it has been necessary to make use of military assistance since November in order to maintain our production at the necessary level. Happily the labour position is now improving slightly, but the shortage of skilled labour for the repair and maintenance of plant and equipment at the gas-works is still acute. By loyal service on the part of those concerned it has been possible to maintain the plant at the highest standard of efficiency which war and post-war conditions permitted.

Benzole and tar have again been produced in large quantities, the yield of the former having been nearly 10% greater than in 1944, while the quantity of road tar sold has also increased by 10%, or by nearly 50,000 gall.

I can now mention a matter which, for security reasons, could not be spoken of last year. During the war a plant for the manufacture of hydrogen for barrage balloons was erected by the Air Ministry at the works, and was operated for nearly three years by the Company's staff. During that time some 135 million cu.ft. of hydrogen of a very high degree of purity were produced, representing a large proportion of the requirements of the balloon barrage in the Eastern Region. The need for hydrogen now having passed, the plant is at present being removed from our works, but it remains that you should know of the letter of thanks which, as your Chairman, I received from the Air Ministry, from which I will now quote. The writer says: "It is appreciated that your undertaking, in common with others in the Industry, have met the varying and intermittent demands of the balloon barrage without fail in a period when you were already faced with many difficulties of your own, and I am to thank you for the active help and co-operation of your Company."

On the distribution and sales side of the Company, the year 1945 has seen, since the termination of hostilities, the beginning of the transition to normal peace-time activities. Despite the extreme shortage of appliances and labour some indication of the increase in development resulting from this transition is shown by the fact that the fittings account for the year at almost £20,000 is roughly twice the total for the previous year, and the figure for the month of December was £3,229, thus showing the progressive increase in work undertaken by the Company for its customers.

It was also possible to resume mainlaying activities, and almost two miles of pipes, including 2,700 yards of 6-in. main at the Trumpington Housing Estate and 300 yards of 12-in. main in Mill Road, were laid. In the last few days of the year work was commenced upon the provision of a new high-pressure supply to the village of Fulbourn, the existing mains having become inadequate due to the increased sales of gas in that area. Permission was also received from the appropriate Ministries, and materials were being obtained by the end of the year for another large scheme of improvement in the supply to the Newmarket Road area beyond Barnwell Bridge.

As part of this programme a new compressor is in course of installation at the gas-works, which will be capable of pumping 300,000 cu.ft. of gas per hour at a pressure of 10 lb. per sq.in. to the outer parts of our area of supply, and to boost up the pressure in various parts of the Borough area, when the heaviest demands of the day occur.

A contract was entered into between the Chesterton Rural District Council and the Company for the lighting of the Parishes of Cottenham, Girton, Impington, Shelford, Stapleford, Willingham and Fulbourn. This contract is for a period of three years with provision for continuing thereafter, and full lighting in these parishes was commenced on Oct. 24. The fires of controversy about the street lighting of Cambridge have died down, and I do not propose to stir the embers. In this connexion I regret that the wilful damage to lamps still continues, and adds to our difficulties in giving the public the service we desire.

The Report of the Heyworth Committee was published in December, by which time the intentions of the Government to nationalize the Industry had been announced. The Heyworth Report recommends the compulsory purchase of all existing undertakings subject to compensation, and the division of the country into ten regions each under its own Board of Directors, who would be appointed by the Minister of Fuel and Power, to take over all the undertakings within its limits. There is yet no indication of how or when the Government will deal with the problem, whether they will adopt the Heyworth plan of regionalization, or whether they will deal with the Industry as a single national unit; but there have been conversations between representatives of the British Gas Council and the Ministry of Fuel and Power. The Industry cannot resist nationalization, which is now in the realm of politics, but it is to be hoped that further negotiations between the British Gas Council and the Ministry will give needful guidance to existing Boards of Directors for the conduct of their affairs in the period which will intervene before nationalization is effected. It is obviously necessary that everything should be done which is required to maintain efficiency and to allow for normal development. That your Board take this view is clear from what I have already told you of the mainlaying activities now going on. But when it comes to other major schemes which are under consideration and might involve large sums, I think it reasonable that before we commit ourselves we should enquire whether such a scheme will be required under nationalization, and how the Company will be compensated if nationalization takes place before the scheme is remunerative, or even possibly before it is completed.

Of the 66 members who left the Company for National Service 26 have already returned to us. We bid them welcome home, and trust that they will not find the transition to peaceful ways too difficult. In particular I would congratulate Sergt. W. J. Grey of the R.A.F. on the award of the British Empire Medal—the third of our members to receive a military decoration. At the same time we would remember with pride those who left us and made the supreme sacrifice.

On behalf of the Board and in your names as shareholders I would thank Mr. Hunter Rioch, the able lieutenants whom he has gathered around him, and indeed all who work for us, on the way they have steered the Company through the dark and difficult years of the war. I would assure them of our confidence in dealing with problems which will arise in the future.

The report and accounts were adopted and the proposed dividends were approved.

A vote of thanks to the Chairman, Directors, and staff was proposed by Mr. E. O. Brown, who remarked that it did not follow that under nationalization gas would be cheaper or that the service would be better.

Mr. **J. Hunter Rioch,** Managing Director, Engineer, and Secretary, who replied, thanked the Directors for their support to the staff.

Wandsworth and District Gas Company

The annual ordinary general meeting of the Wandsworth and District Gas Company was held on Mar. 5 at Fairfield Street, Wandsworth.

Mr. Frank H. Jones, M.Inst.C.E., Chairman and Managing Director, in the course of his address said: The Company has, during the last year, sold more gas by 6% than ever recorded in its previous history. There have been many difficulties to overcome, especially those relating to the provision of coal and to the shortage of skilled labour. These difficulties still exist, especially in the shortage of labour and materials, and those who have served the Company loyally through the war period are probably still weary from the war, and, at times, things seem worse than even those prevailing during the war period. It is, however, reasonable to expect that these problems will progressively improve during this year, and eventually become more easy and more normal.

Future of the Industry

The future administration of our Industry is, as you know, in a somewhat nebulous and uncertain state, owing to the probability, or, at any rate, anticipation that the Industry as a whole may be nationalized in the near future. The shareholders will appreciate that it is impossible to anticipate what the effect of this may be, but the public may rest assured that the great reputation held by our Industry in the past will be maintained, whatever be the future ownership of the undertakings.

Your Directors consider, however, that whatever the immediate future would be, it is of primary importance that a progressive outlook be maintained, and plans for improvement of plant and service be put into effect as soon as possible to ensure that there is no period of hiatus in development through the adoption of a "Wait and see" policy.

After providing for the basic dividend we have been able to increase the carry-forward on profit and loss account. In addition £20,000 has been earmarked towards the cost of the deferred repairs and renewals, in respect of which higher expenditure is bound to be incurred during the next two or three years. On the other hand, no additional

provision has this year been made for war damage contribution, for which an allocation of £35,000 was made in the 1944 accounts.

All the works have been maintained in such condition as is possible under the present and past existing restrictions. Also, the mains of the Company have been maintained at a state of efficiency in spite of the prevailing difficulties. Progress has been made by addition to the existing manufacturing and distribution plants, particularly in so far as the technical control of such processes are concerned. The Company has maintained all its legal requirements as to purity and pressure, although at times during the latter weeks of the year very severe difficulties prevailed.

The ships of the Company have been running satisfactorily. During the war three Masters and one Chief Engineer were honoured by H.M. the King by the award of an O.B.E. and three M.B.Es. in addition to two commendations for gallantry. Two gunners serving the ships also received awards.

Public Appreciation of Gas

Public appreciation for gas, not only for domestic uses, but for industrial and commercial purposes, has been shown by the fact that the industrial sales, in spite of the fact that the war is now completed and munition production to a large extent has ceased, is still showing a considerable increase in business, and very many important inquiries for commercial utilization of gas in the Company's area are in hand.

As regards the domestic consumer position, the present number of consumers is slightly more than it was at the beginning of the war.

In view of the increasingly critical situation with regard to coal and its derivatives, the Government have tended to tighten their control of one of our by-products—coke. The supply of coke to non-industrial premises, as well as small industrial users, is governed by Restriction Orders issued from time to time by the Ministry of Fuel and Power. Such restricted quantities can only be supplemented by licences granted by local fuel overseers.

The larger industrial users have been programmed by the Coke Directorate, and these quantities may not be exceeded by the suppliers. In abnormal circumstances, of course, further consideration is given by the directorate upon application by consumers. The regulation and control of coke supplies has been carried a step further during the year by the programming of merchants' quantities.

Producers are expected to carry out these arrangements, and if the amount of coke available is insufficient, then the Coke Directorate will endeavour to meet the deficit with furnace or gas coke from other parts of the country where there is a surplus. Unfortunately, the amount of coke available for sale by your Company for the present year is considerably less than in the twelve months referred to above, and we have been obliged, therefore, to import coke in this way to meet our obligations.

The report was adopted.

Gas Undertakings' Results

Brighton, Hove and Worthing Gas Company.—Sales of gas at 15,597,606 therms during 1945 showed an increase of 10.36% compared with those of the previous year, and yielded £865,155 against £785,493. Consumers increased in number by 2,210. After charging revenue account with £33,917 in respect of the employees' co-partnership fund, contributory pensions fund and sick and benefit and hospital funds, and appropriating £10,000 to the renewal fund and £2,500 to special purposes, the profits for the year, including interest received, amounted to £151,770, to which was added £17,306 brought in from the previous year, making a total of £169,077. After deducting £71,707 for interest, tax, &c., £97,370 remained available for disposal. Final dividends are proposed, making, in the case of the 6% and 5% Standard Consolidated stocks, a total distribution of £5 12s. 6d.% and £4 11s.% respectively for the year. The balance carried forward is £24,030. During the year £20,000 5% Standard Consolidated stock was issued to the trustees of the co-partnership fund, the proceeds, including premium of £2,066, being carried to capital account.

Bristol Gas Company.—Gas sales in 1945 were 5,041 million cu.ft. (yielding £1,090,597) compared with 5,081 million cu.ft. (£1,028,160) in 1944, and gas unaccounted-for at 6.01% was the lowest recorded since 1937, and was 1.57% below the percentage for the previous year. In the change-over from war to peace there was a reduction of 0.79% in commercial and industrial sales up to the end of the year. A final dividend of 5% on the General Capital stock absorbs £20,841, and leaves a carry-forward of £77,681. Speaking at the annual meeting on Feb. 28, Mr. G. H. Boucher, Chairman, said plans were being prepared for the reconstruction of the carbonizing plant, and schemes would be submitted to the Ministry of Fuel and Power in the very near future. The proposed reconstruction would be divided into two sections: (1) extension of carbonizing plant and distribution system to deal with gas requirements within the existing area of supply, and (2) further extensions, including holder storage, to supply gas over a much larger area under any nationalization planning.

Cambridge University and Town Gas-Light Company.—Final dividends have been declared, making 10% for the year on the Consolidated Original stock, 7% on the Consolidated "B" stock, and 5% on the Consolidated "C" stock. Gas sales in 1945 totalled 5,913,845 therms and yielded £253,180, and the balance carried to profit and loss account was £28,505. Consumers at the end of the year numbered 28,245, comprising 14,489 ordinary, and 13,756 prepayment. Authority has been obtained from the Ministry of Fuel and Power to proceed with the laying of new mains to improve the supply of gas in certain districts. One scheme is already in hand, and it is hoped to make a start with another in the near future.

East Surrey Gas Company.—A final dividend of 5%, the same as or the half year to June, was declared at the annual meeting on Feb. 27. Gas sales for 1945 totalled 3,400,796 therms and yielded £229,729. Of a total revenue of £328,126, the balance carried to profit and loss account was £36,893. The balance of net profit was £9,773, and the payment of dividends leaves £3,333 to be carried forward, against a net balance of £1,850 brought in.

Dividends

Plymouth and Stonehouse Gas Light and Coke Company.—Interest for the half-year to Mar. 31, 1946, will be paid on April 1 at standard rates on the 3%, 3½%, 4%, and 5% Debenture stock, less tax. For transferees to receive this interest transfers must be lodged with the Company by Mar. 14.

Radiation, Ltd.—The Directors are recommending a dividend for 1945 on the Ordinary stock of 10%, less tax, the same as for 1944. Net income for the year amonnted to £147,461, compared with £148,512 the previous year. Dividend warrants will be despatched to stockholders on April 3.

Tottenham and District Gas Company.—Final dividends are recommended as follows: Ordinary stock 2½% actual, less tax, making 5% for the year ended Dec. 31; 5% Preference stock 2½% actual, less tax, making 5% for the year; 5½% Preference stock 2¾% actual, less tax, making 5½% for the year. Taxed profit for year was £135,241 (last year £86,381).

Yorktown (Camberley) and District Gas and Electricity Company.—The Directors recommend the following dividends in respect of the half-year ended Dec. 31: 5% Consolidated Preference stock 2½% actual, making 5% for the year; 4% Redeemable Preference stock 2% actual, making 4% for the year, and Consolidated Ordinary stock 2¾% actual, making 5½% for the year. Profit on revenue account for the year was £37,255 (1944, £32,970); undivided profit forward £4,891 (1944, £4,217).

UTILIZATION OF WASTE HEAT, &c.—continued from p. 437

General Considerations and New Methods

The 37% recovery efficiency of recuperators could be improved by increasing the area of the heating surface. Pexton has shown that, up to 40 sq. ft. of recuperator per ton of coal per day, there is a rapid fall in fuel consumption. At this point the fall slows up and the deciding factor is the cost of construction. Fishenden and Saunders have shown that flue width could be increased with advantage from the normal 4 to 6 in. The low conductivity of firebrick is also a limitation, and it is suggested, as an example, that carborundum, with four times the conductivity of firebrick, would give better results. "To employ material such as heat-resisting metals of really high conductivity is a natural conclusion."

"No attempt has yet been made to pre-heat, by heat recovery, the primary air required for the producers of gas-retort settings," mainly because of the fear of resulting clinker troubles. These could be got over by balancing steam and air supplies. Pexton suggests that the residual heat of the coke could be used for this purpose, at any rate in continuous verticals. Recuperators, with intermittents, could be made to take both primary and secondary air, in which case the waste gases would be cooled to so low a temperature that the waste-heat boiler would be dispensed with.

With waste-heat boilers, "augmentation" provides a means of raising steam beyond the amounts available from waste-heat alone, giving the necessary flexibility to cover the difference between the day and night requirements of the works. Producer gas is by-passed direct to the waste-gas flue, burning with the residual oxygen in the waste gases. For example, when producer gas is burned with 25% excess secondary air the waste gases contain 2.3% O_2. The combustion of this with producer gas liberates a further amount of heat more than equal to that delivered to the boiler by the waste gases, thus raising over 100% more steam. Both air and producer gas may be added to the waste-gas stream, the inlet boiler temperature being controlled by recirculating the gases from exit boiler. Additional steam is obtained in these ways without increased labour.

Dry-cooling of coke is successfully applied to coke ovens at Dagenham, extracting 81.6% of the sensible heat of the coke and providing 0.34 lb. of steam at 150 lb. and 240°F. superheat, with an efficiency of 81.2%, excluding fan power. Applied to the Gas Industry this process should raise 540 lb. steam per ton of coal carbonized from intermittent chambers and 450 lb. from horizontal retorts.

Pexton has made two further suggestions for heat recovery: (1) The addition of blue water gas to the base of vertical retorts, and (2) the recirculation of coal gas from the top of the retort to the base.

GAS PRODUCTS PRICES—STOCKS AND SHARES

The London Market Mar. 11.

There are no changes to report in the prices of Coal Tar products, the majority of which are controlled either by Government Order or by agreements.

The following are controlled by Government Orders at the prices indicated:—

Road tar at 5½d. per gallon filled into buyers' tanks at sellers' works, with corresponding prices when delivered and when supplied in packages.

The price sprayed direct on to roads is controlled by agreement and is 8½d. per gallon for full tank loads in London and adjacent counties.

Creosote for hydrogenation is based on 5.875d. per gallon and creosote for timber preservation on 5½d. per gallon *ex* sellers' works, with the usual extras for different qualities, packages, &c.

The basic price for cresylic acid is 3s. 6d. to 5s. per gallon, according to grade.

Hot pressed naphthalene costs £11 11s. in bulk *ex* distillers' works. Prices for refined naphthalene vary from £20 15s. per ton for crystal on 50-ton contracts to £26 15s. per ton for ball and flake. These prices are delivered England and Wales in 2-cwt. bags, minimum 4-ton lots.

The maximum prices for coal tar naphtha vary from 1s. 11d. to 2s. 11d. per gallon and for xylol from 3s. 3½d. to 3s. 6d. per gallon delivered buyers' address in minimum 1,000-gallon lots in bulk. The maximum price for pure toluene is 3s. 2½d. per gallon in bulk *ex* sellers' works.

The following prices are controlled by agreements:—

Pitch for briquetting is 70s. per ton *ex* sellers' works in bulk.

Phenol is 9½d. to 11½d. per lb. in large returnable drums delivered buyers' address, according to quantity.

The Provinces Mar. 11.

The average prices of gas-works products during the week were: Pitch, 70s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6½d. per gallon; pure, 3s. 2½d. Prices for carbolic acid 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil are controlled by S. R. & O. 1943, 1538, and for naphthalene by S. R. & O. 1944, 1051. Prices for road tar were increased by a half-penny per gallon by S. R. & O. 1945, 229, under which Order there was also an increase of 5s. per ton in the price for standard creosote-pitch mixture.

The bulk of the pitch produced in this country is required for home trade purposes, but certain quantities are being sent at higher prices to Allied countries with the approval of the Coal Tar Control. So far as creosote is concerned the bulk is required for essential purposes, at controlled prices. With regard to hydrocarbon oils, the prices remain fixed, although there is more freedom than was previously the case.

Scotland Mar. 9.

Production is still short of demand and prices continue firm. Refined tar*: Yield to the Distillers is 5d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d. Hydrogenation oil,* 5⅞d.; low gravity or virgin oil,† 7¼d. to 7½d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 7d. to 8d. per gallon. Solvent naphtha*: Basic maximum prices delivered in bulk, 90/160 grade, 2s. 10d., and 90/190 Heavy naphtha, Unrectified, 2s. 0½d.; Rectified, 2s. 4d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

Although the volume of business was almost on a par with that of the previous period, markets were in a somewhat hesitant mood throughout the greater part of last week, and there was a pause in the advance of British Funds. Just before the close, however, conditions became a little brighter and some good features appeared among industrials.

Fairly quiet conditions prevailed in the Gas Market. The majority of the few price changes were in an upward direction, although with one exception, that of British Ordinary, which rose a further 4 points, the movements were small. This Stock has been making steady progress for some weeks past, and possibly buyers are being attracted in the hopes that the Company may return to its pre-war dividend rate of 7%.

The following were the price changes on the week:

PROVINCIAL EXCHANGES

Chester Ord.	114—116	−1	
Sheffield Cons. (*x.d.*)	130—135	Feb. 25	

OFFICIAL LIST

Alliance & Dublin Ord.	120—125	−2
Brighton Cons. (*x.d*)	106—111	Mar. 4
British Ord.	122—127	+4
Commercial 3 p.c. Deb.	82—87	+1
Gas Light Units	21/6—22/6	+−/3d.
Ditto 5 p.c. Red. Deb.	105—108	+¼
Ditto 4½ p.c. Red. Deb.	105—108	+¼
Imperial Continental Ord.	110—113	−2
Primitiva Holdings Ord.	12/—13/−	−−/6d.
Tottenham Ord. (*x.d.*)	108—113	Mar. 4
Ditto 5 p.c. Pref. (*x.d.*)	107—112	"
United Kingdom Gas Corporation Ord.	20/9—21/9	−−/3d.
Wandsworth 4 p.c. Pref.	100—103	+1

SUPPLEMENTARY LIST

Cheltenham 4 p.c. Deb.	98—103	+1

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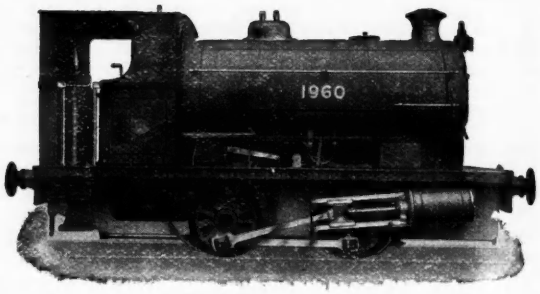

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